

FREE AND OPEN-SOURCE SIMULATION SOFTWARE “URURAU”

Túlio Almeida Peixoto
João José de Assis Rangel
Ítalo de Oliveira Matias

Universidade Candido Mendes
100 Anita Pessanha St, Pq. São Caetano
Campos dos Goytacazes, RJ, 28030-335, BRAZIL

ABSTRACT

Ururau is a free and open-source software written in the Java programming language. The Ururau is able to develop models of simulation at any of the component layers of the software structure. This means that models can be constructed on the layer of the library (lower level), in the core of the software (new palletes, for example) or top layer of the graphical interface. Then, if you want to build simulation models with non-commercial software, with the option to either write its code both in Java as in a graphical user interface of simple operation, you have the option of using Ururau.

1 INTRODUCTION

This extended abstract aims to present a software, named Ururau, which can be used in the construction of Discrete Event Simulation (DES) models. The Ururau is a Free and Open-Source Software (FOSS) developed in Java by a group of researchers interested in understanding and promoting the design and structure of the source code of a software for development of DES models. It is possible to develop simulation models using Ururau both in a GUI of simple use as in Java, in the lowest layer of software, or even interconnect modules of the JSL simulation library in the middle layer. The origin of the word Ururau refers to a legend of the eighteenth century about an alligator that lived in the river that goes through the city where the researchers of this project live. We emphasize that, similarly to Ururau software, there is also the JaamSim.

2 INSTALLING AND USING URURAU

2.1 How to get Ururau

The researchers of the software Ururau use the controller of versions for FOSS named Bitbucket. Bitbucket is a site for collaborative development, i.e., allows multiple developers to work on the same source code. Thus, the developer interested in cooperating registers himself, and the project manager allows the developer to submit the code changes to the site. However, anyone has access to the code without having to register. The process consists of installing the Mercurial (<https://mercurial.selenic.com>) and making the command "hg clone <https://bitbucket.org/ururau/ururau>". Then, for the development and use of software Ururau, the user goes freely to <https://bitbucket.org/ururau>. After downloading the zip file, he/she unzips it into a directory and runs ururau.jar. It is important to highlight that the Environment Java Runtime (JRE) version 6.0 or higher, which can be obtained in <http://java.com/getjava>, must be installed on the computer.

To build the model, using the source code, it is required a development environment - Integrated Development Environment (IDE), preferably NetBeans 7.0, which can be obtained in <http://www.netbeans.org>.

The environment of Ururau is internally composed by one or more process commands, which extends functionalities of the JSL. The file README.TXT, which presents an explanation on how to operate each command, can also be downloaded at the same address in the software.

2.2 Applications with Ururau

The researchers who work on the project of Ururau software is currently involved with issues related to the following points:

(a) Comparative tests of DES models built in Ururau and other commercial simulators such as Arena and ProModel. In this topic, the work of Peixoto *et al.* (2013) presents some results achieved so far and shows that the Ururau allows execution of simulation models up to five times faster than commercial software with equivalent results.

(b) Research on new methods to be employed in the modeling and simulation of dynamic and stochastic systems with aspects, for example, of incorporation of Artificial Neural Networks to represent intelligent decisions in DES models. In this issue, the work of Silva *et al.* (2014) presents the results achieved so far.

(c) Use of the JSL library and Ururau software to be employed in the execution of simulation models of Monte Carlo. In this subject, the work of Peixoto, Rangel and Matias (2012) also presents the results obtained.

(d) Development of mechanisms and palettes in the GUI of Ururau software to enable integration of DES models with Programmable Logic Controllers.

(e) Construction of DES models in Ururau considering discrete aspects associated with transport systems integrated with the continuous component of the emission of pollutant gases from a fleet of trucks. In this topic, Rangel *et al.* (2013) report the results achieved so far and show there is no direct relationship of proportionality between, for example, the delivery time of products and the total of the carbon monoxide emissions produced by vehicles of the logistics system.

3 FINAL REMARKS

This abstract presented the Ururau software and provided an overview of its features and how to use it. We encourage readers interested in using it to visit the site in <https://bitbucket.org/ururau>.

We also recommend reading the paper King and Harrison (2013), in which the FOSS JaamSim was recently presented.

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